NEBRASKA HEALTH AND HUMAN SERVICES SYSTEM

Congenital Primary Hypothyroidism Information

Congenital primary hypothyroidism, or CPH, is the most common disorder detected by newborn blood spot screening. It is caused by inadequate production of thyroid hormone. Thyroid hormone is important for the normal functioning of all of the body's organs and is essential for normal brain development. The incidence of congenital primary hypothyroidism is estimated at 1:3,600 to 1:5,000 live births.

The most common causes of CPH are total or partial failure of the thyroid gland to develop (aplasia or hypoplasia), or its development in an abnormal location (an ectopic gland). The screening program is not designed to detect less common causes of hypothyroidism such as those caused by pituitary insufficiency, or late onset hypothyroidism.

Clinical Features:
Deficiency of thyroid hormone in an infant may result in mental and growth retardation if it is not diagnosed and treated early in life. Many infants with CPH may appear clinically normal before 3 months of age, by which time some brain damage has usually occurred.
When symptoms or signs are present, they may include prolonged neonatal jaundice, constipation, lethargy and poor muscle tone, feeding problems, a large tongue, puffy face, large fontanelle, distended abdomen, and umbilical hernia. However, these signs and symptoms are non-specific for CPH, are found in fewer than 30% of neonates with CPH, and may be present in infants without the condition. Therefore, in the newborn, clinical signs and symptoms are not reliable indicators of CPH.

Laboratory Tests:
The screening test is the thyroxine (T4) assay performed on a dried blood filter paper spot. Samples with T4 in the lowest 10% of the run, reflex to a TSH (thyroid stimulating hormone, or thyrotropin) assay, performed on a new punch from the same specimen. Those with elevated TSH's are reported out as presumptive positive.
The confirmatory test recommended is a Free T4 and TSH performed on a serum sample. Further studies T3 and radiographs may be recommended to assist with treatment recommendations in difficult to diagnose cases.

Different combinations of screening test results are possible:

TEST RESULTS	LIKELY CAUSES	ACTIONS TO TAKE WHEN POSITIVE RESULT FOUND
T4 low (lowest 10th % of run) and TSH elevated	Hypothyroidism Prematurity False positive Specimen collected too early	Laboratory immediately notifies via phone and fax (followed in writing) submitter, newborn's physician and NNSP. Newborn's physician assesses condition of newborn and orders confirmatory or repeat tests as appropriate.
T4 low/TSH normal	Thyroid Binding Globulin(TBG) deficiency Pituitary gland problems with secondary hypothyroidism Prematurity	While these are abnormal test results, they are NOT abnormal for congenital "primary" hypothyroidism Forward results to submitter

Thyroid Function in Premature Infants:
In premature infants, there appears to be a physiological reduction in blood T4 levels. This is not due to a low thyroid binding globulin (TBG) and the TSH levels are not usually elevated. These cases need special observation and follow-up to ensure that the low T4 levels rise to the normal range as the infant matures, but this may take several weeks.

Confirmation and Treatment:
Consultation with a pediatric endocrinologist should be made for confirmation and diagnosis. (See Congenital primary Hypothyroidism ACT sheet). Upon notification of a positive screening result the physician should collect or cause to be collected 200 µl of serum specimen. This should be tested for FreeT4 and TSH. Treatment of congenital primary hypothyroidism is simple and effective. Thyroid hormone in pill form, is crushed, mixed with food and administered once daily.

Infants should be seen several times for an exam and blood test to check T4 and TSH levels to assist in regulating the dosage. As infants grow, the dose of thyroxine is increased. Infants should also undergo periodic developmental testing.

Screening Practice Considerations:
Congenital primary hypothyroidism is the most common disorder detected by the blood spot testing. Detection does not depend on nutritional factors. A blood transfusion may alter the values; therefore THE NEWBORN SCREENING SPECIMEN SHOULD ALWAYS BE COLLECTED PRIOR TO A BLOOD TRANSFUSION.

The normal newborn demonstrates a TSH surge in the first hours of life as an adaptation to the extrauterine environment. To be valid, a specimen must be collected when the infant is 24 to 48 hours of age. If an infant is tested "early" (less than 24 hours of age) a repeat specimen must be collected by seven (7) days of age, regardless of prior test results.
Prompt confirmatory testing is required even if there is evidence to suggest that one of the situations associated with false positive screens is present. These situations can include early specimen collection and prematurity. The presence of any of these does not exclude the possibility of disease.

PLEASE NOTE:
This screening test is not designed to detect TBG deficiency or causes of hypothyroidism other than congenital primary hypothyroidism. In addition, some infants develop late onset congenital primary hypothyroidism. If TBG deficiency or another form of hypothyroidism is suspected, or in the presence of clinical symptoms, appropriate exams and studies are indicated. Therefore, in the presence of clinical symptoms, evaluation for hypothyroidism should be performed despite normal newborn screening results.